REMARKS/ARGUMENTS

Upon entry of the instant amendment, claims 24, 29, 34, 38, 42, 46-50, 52, 54, 55, 58, 59, 61 and 62 will be amended, and claims 65-68 will be added, whereby claims 24-68 will be pending. Claims 24, 29, 34, 38, 42, 49, 50, 51, 52, 55, 58, 59 and 62 are independent claims.

Applicants note that claims 51 and 58 have been indicated to be allowed. Moreover, claims 24-33, 36-45, 52-57 and 59-64 have not been rejected over prior art, but have indicated to be allowable if the 35 U.S.C. 112, indefiniteness rejections are withdrawn. Accordingly, at least claims 24-33, 36-45 and 51-64 should be in condition for allowance. However, for the reasons discussed below, Applicants respectfully submit that each of the pending claims is in condition for allowance, and an early mailing of the Notices of Allowance and Allowability is respectfully requested.

Still further, claims 65-68 have been added in accordance with claims 6 and 7 of the originally filed International Application.

Reconsideration and allowance of the application are respectfully requested.

Response to Formal Matters

Applicants express appreciation for the acknowledgment of the claim of priority as well as receipt of the certified copy of the priority application.

Applicants also express appreciation for the return of the initialed Form PTO-1449, whereby the Examiner's consideration of Applicants' disclosure statement filed February 13, 2002 is of record.

Response To Objection To Specification

In response to the objection to the specification as not containing an Abstract of the Disclosure, Applicants respectfully submit that an appropriate abstract has been filed with the application by submitting a copy of the cover page of the published PCT application, i.e., WO 00/69790. However, by the present amendment another abstract is provided on a separate sheet as required in the Office Action. Accordingly, this ground of objection should be withdrawn.

Response To Rejection Under 35 U.S.C. 112, Second Paragraph

In response to the rejection of claims 24-5-, 52-57 and 59-64 under 35 U.S.C. 112, second paragraph, as being indefinite, Applicants respectfully submit the following.

In this ground of rejection, it is asserted that the claims are indefinite for a number of reasons. In response, Applicants respectfully submit that each of the grounds stated in this indefiniteness rejection is without appropriate basis because one having ordinary skill in the art would readily understand the metes and bounds of Applicants' claims.

Despite the inappropriate basis for the rejection and in an attempt to advance prosecution of the application, Applicants have amended the claims to even further clarify their language by making what should be considered to be cosmetic changes to the claims. For example, one having ordinary skill in the art would understand the scope and content of "low" in claim 34, and the claims in dependent form clearly define Applicants' invention. However, in an attempt to advance prosecution, a number of claims have been amended into independent form, and "low" has been deleted from claim 34. Moreover, the claims have been amended in accordance with

the Examiner's suggestions.

Accordingly, the 35 U.S.C. 112, second paragraph, rejection should be withdrawn, and no estoppel should be associated with these amendments.

Response To Rejections Based Upon Prior Art

Rejection of claims 34, 35 and 46-50 under 35 U.S.C. 103(a) as being unpatentable over EP 294,208 (hereinafter "EP '208").

In response, Applicants note that independent claim 34 is directed to nanocorundum powders comprising a close particle size distribution in nanometer range, comprising a narrow width of size distribution of isometrically formed particles $D_{84} < 150$ nm, less than 0.05% by weight chlorine, at least 60% α-aluminum oxide, and the powders are redispersible. Claim 35 further defines claim 34 by reciting a process for the production of sintered corundum products in a form of dense or porous compact bodies, layers or granulates, comprising sintering nanocorundum powders according to claim 34 at temperatures $\leq$ 1450°C to form granulate or sintered corundum bodies having an average grain size of ≤ 0.6 μm.

In contrast to Applicants' disclosed and claimed subject matter, EP '208 is directed to providing a solid, shaped and fired refractory article comprising at least 60% alumina by weight, preferably 90 % by weight, in which substantially all the alumina is in the alpha phase having a uniform grain structure comprising alpha alumina crystallites wherein the average crystallite diameter is less than 0.5 micrometer and substantially all the alpha alumina crystallites are less than 0.7 micrometer in diameter and the density of the article is greater than 90% of theoretical

density. The refractory article can also comprise up to 40 percent by weight of nucleating agents and modifying agents.

EP '208 discloses that microcrystalline alpha-alumina based ceramic articles can be provided by the addition of suitable quantities, for example 0.1 to 7.0 weight percent iron equivalence, preferably 0.3 to 1.5 weight percent iron equivalence, of at least one colloidal-polymeric hydrous iron complex to an alumina precursor such as a basic aluminum salt solution. The polymer which is generated by the controlled hydrolysis of an iron salt solutions when added to an alumina precursor, such as a basic aluminum salt solution, is disclosed to dramatically increases the alpha phase nucleation density during calcining of the derived alumina resulting in the production of a fully converted, very fine (average crystallite size less than 0.5 micrometer), and substantially dense alpha alumina microstructure. The alumina derived from basic aluminum salts without the addition of the nucleating agents convert to alpha alumina at approximately 1100 - 1150°C and a weak, porous and large grained (average grain size greater than 4 micrometers) structure is obtained.

Accordingly, EP '208 is directed to materials having a certain microstructure, and this is not the particles recited in Applicants' claim 34. In particular, the "articles" disclosed by EP '208 are fired materials with an inner microstructure. These articles do not comprises powders as recited by Applicants. In other words, Applicants' claim 34 is directed to nanocorundum powders comprising a close particle size distribution in nanometer range, comprising a narrow width of size distribution of isometrically formed particles $D_{84} < 150$ nm, less than 0.05% by weight chlorine, at least 60% α-aluminum oxide, and the powders are redispersible. In contrast,

EP '208 is directed to grain size of a microstructure which is not present in Applicants' claims 34 and 35. This is different from Applicants' recited nanocorundum powders which are individual powder particles. This argument also applies to Applicants' newly submitted claims 65-68.

Still further, Applicants' claim 46 is directed to Al_2O_3 sintered product comprising a sintered mass of the nanocorundum produced according to claim 28 and which consists essentially of Al_2O_3, wherein through annealing at 650 to 1250°C, there is a phase composition of more than 80% corundum and an average pore size of 10 - 100 nm with a porosity of ≥ 30% by volume.

Applicants' claim 47 is directed to Al_2O_3 sintered product comprising sintered corundum layers on a substrate produced according to claim 38 and which consists essentially of Al_2O_3, wherein through annealing at 650 to 1250°C, there is a phase composition of more than 80% corundum and an average pore size of 10 - 100 nm with a porosity of ≥ 30% by volume.

Applicants' claim 48 is directed to Al_2O_3 sintered product comprising sintered corundum layers on a substrate produced according to claim 42 and which consists essentially of Al_2O_3, wherein through annealing at 650 to 1250°C, there is a phase composition of more than 80% corundum and an average pore size of 10 - 100 nm with a porosity of ≥ 30% by volume.

Applicants' claim 49 is directed to dense sinter corundum layers consisting essentially of Al_2O_3 on a substrate produced by a process for producing redispersible nanocorundum with an average particle size D_{50} < 100 nm with addition of nuclei that promote transformation to corundum in subsequent annealing, which process comprises:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting

materials, chlorine-free inorganic precursors;

(b) hydrolyzing the solution or the sol of (a) through the addition of a base in a mole ratio of base:precursor of 1 to 3;

(c) aging the hydrolyzed solution or sol of (b) at temperatures between 60 and 98°C for 1 to 72 hours;

(d) applying the aged hydrolyzed solution or sol of (c) to a substrate;

(e) subsequently drying the applied aged solution or sol of (d) followed by calcination at temperatures between 350 and 650°C for converting hydrolyzed precursor into a semiamorphous intermediate phase and ultimately into transitional aluminum oxides; and

(f) performing annealing by increasing temperature to $\leq$ 950°C for converting product of (e) into corundum phase,

wherein the substrate is composed of a different material from the corundum layers, and in which through sintering at a temperature of $\leq$ 1250°C there is an average grain size of $\leq$ 0.5 μm.

Applicants' claim 50 is directed to dense sinter corundum layers consisting essentially of Al_2O_3 on a substrate produced by a process for the production of sintered porous or dense corundum layers on a substrate by a process for producing redispersible nanocorundum with an average particle size D_{50} < 100 nm with addition of nuclei that promote transformation to corundum in subsequent annealing, which process comprises:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, organic precursors;

(b) hydrolyzing either (i) with excess water through addition of the precursor solution or the precursor sol of (a) to water at a mole ratio of water:precursor $\succ$ 3, and with addition of an acid that leads to pH = 3-5, or (ii) through addition of an amount of water restricted to a mole ratio of water:precursor $\preceq$ 3 to the precursor solution or precursor sol of (a) that are to be mixed with complex-forming ligands;

(c) aging the hydrolyzed solution or sol of (b) at temperatures of $\preceq$ 50°C within 5 hours, and subsequently aging at temperatures of 80 to 98°C within 1 to 24 hours;

(d) applying the aged hydrolyzed solution or sol of (c) to a substrate;

(e) subsequently drying the applied aged solution or sol of (d) followed by calcination at temperatures between 350 and 650°C for converting the hydrolyzed precursor into a semiamorphous intermediate phase and then to transitional aluminum oxides; and

(f) performing annealing by increasing temperature to $\preceq$950°C for converting product of (e) into corundum phase,

wherein the substrate is composed of a different material from the corundum layers, and in which through sintering at a temperature of $\preceq$ 1250°C there is an average grain size of $\preceq$ 0.5 μm.

In contrast to Applicants' disclosed and claimed invention in claims 46-50 which consists essentially of Al_2O_3, EP '208 discloses the addition of suitable quantities, for example, 0.1 to 7.0 weight percent iron equivalence, preferably 0.3 to 1.5 weight percent iron equivalence, of at least one colloidal-polymeric hydrous iron complex to an alumina precursor such as a basic aluminum salt solution. Accordingly, EP '208 does not teach or suggest Applicants' disclosed and claimed

invention as recited in claims 46-50.

For the reasons set forth above, the rejections based upon EP '208 should be withdrawn.

Rejection of claims 34 and 35 under 35 U.S.C. 103(a) as being unpatentable over EP 554,908 (hereinafter "EP '908").

Applicants note that EP '908 is directed to nano-sized powders of alpha alumina obtained from a boehmite gel doped with a barrier-forming material such as silica, which is then dried, fired and comminuted to powder form.

Thus, the process disclosed by EP '908 starts with boehmite. In contrast, and as discussed throughout Applicants' discussion of the prior art in the background of their specification, there are a number of disadvantages resulting from the use of boehmite. Applicants' advantageous powders are a result of a process that avoids the use or even intermediate formation of boehmite.

Moreover, EP '908 discloses in Example 1 that nanocorundum powder could be obtained from a coarser commercial alumina powder by simple milling.

Regarding the product claims 34 and 35, the different processes disclosed by EP '908 as compared to Applicants provides a different product that does not teach nor suggest Applicants' product. Moreover, while EP '908 provides particle data, data using techniques such as from a measured specific surface (BET) or from electron microscopic images. However, this data is not

as accurate as the measuring techniques disclosed by Applicants, such as the Zeta-Sizer disclosed in Applicants' Example 1. These arguments also apply to newly-added claims 65-68.

Therefore, the rejection of claims 34 and 35 based upon EP '908 should be withdrawn.

Double Patenting Rejection Of Claims 46-48

In response to the obviousness-type double patenting rejection of claims 46-48 over claims 6 and 21 of U.S. Patent No. 6,399,528, Applicants respectfully submit the following.

As discussed above, Applicants' claimed invention in claims 46-48 recite consisting essentially of Al_2O_3. In contrast, U.S. Patent No. 6,399,528 claims porous aluminum oxides that include Al_2O_3 and Zr. Accordingly, U.S. Patent No. 6,399,528 does not teach or suggest Applicants' disclosed and claimed invention as recited in claims 46-48.

For the reasons set forth above, the obviousness-type double patenting rejection should be withdrawn.

CONCLUSION

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejection of record, and allow all the pending claims.

Allowance of the application is requested, with an early mailing of the Notices of Allowance and Allowability.

If the Examiner has any questions or wish to further discuss this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.

Respectfully submitted,
Andreas KRELL et al.

Neil F. Greenblum
Reg. No. 28,394

Reg. 33,094

August 19, 2003
GREENBLUM & BERNSTEIN, P.L.C.
1950 Roland Clarke Place
Reston, VA 20191
(703) 716-1191